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opposed in their diet, whilst other groups again, alike in their food, signally differ in their coloration."——Dr. Horn's elaborate monograph of the species of Chrysobothris inhabiting the United States, gives the result of a great deal of labor, both with the pencil and pen; the plates are most excellent and rich in details.

ZOÖLOGY.

HAIR-LIKE PROCESSES ON GLANDULAR EPITHELIUM.—Tornier describes in *Arch. f. Mikrosk. Anat.* for June, 1876, hair-like appendages found on the glandular epithelium in the stomach and renal tubules of vertebrates (Amphibia, lizard, rabbit, and mouse). The difficulty of detection, and especially the circumstance that these exist only at the time when the glands are actually secreting, has hitherto prevented their discovery. They differ from cilia by being smaller, not yet detected in constant motion, and in their fugitive character. Doubtless they are somehow connected with the function of secretion.—*G. M.*

ORGANS OF FLIGHT.—M. P. C. Amans sums up an extensive survey of the organs of flight of the animal kingdom by distinguishing two principal types of the machine—the insect and the vertebrate. In the former the principal part is formed by the meso and metathorax; in each segment the endosternum forms the longitudinal axis of the floor; the flanks are sustained by three vertical pieces, and the upper edge by two; the roof of each segment is formed by two parts, which are concave below and without. The frame-work of the wing is formed by six primary nervures and their ramifications, which are alternately related to the sides or the roof; the general form of the wing is that of a biplanar triangle, with the base centripetal and the apex centrifugal. The base is formed of an anterior and a posterior plane, the latter being the more developed; the base of the wings united to the flanks and to the roof of each segment by as many articular pieces as there are nervures. The apparatus of formation is constant, and may be considered as consisting of an anterior piece, which forms a movable pivot, separated by an articular cavity from the fixed pivot. The wing is able to undergo torsion, thanks to the articulations of the anterior and subanterior nervures with their basal terminations. The line of torsion is a nerve which passes through the basal head of the posterior nervure by a special commissure, and through the basal extremity of the proantërior process when it is stretched. The centrifugal extremity of the wing follows in air and during ascent the course of a sinuous line. The wing is never comparable to a simple lever; it is most nearly so in the Pseudoneuroptera; the basilar pieces (including the roof) may be grouped under three sides of a cone of revolution, and the muscles are grouped according to these; the muscles vary greatly in direction, and it is not correct to speak of exclusively vertical or horizontal muscles.

The bat and the bird are the types of the vertebrate machine; in them the hard pieces are internal, the motors external, and this is the fundamental difference between the two types. The general form of the machine and of the wing, and the distribution of consistency to the surface, as well as the rotation of the anterior edge, is comparable to what is seen in insects.—*Journ. Roy. Micr. Soc., April, 1886.*

UNUSUAL ABUNDANCE OF AURELIA AURITA.—From the 1st of July until the 10th, *Aurelia aurita*, the common large jelly-fish, abounded in enormous numbers in Casco bay, Maine. They were gathered into shoals, for at least hundreds of yards in extent, many of them in a dying condition, floating on their backs, and causing calm areas and streaks when the surface of the bay was elsewhere ruffled. At high water they stranded on the shore, forming patches four or five yards wide and hundreds of yards long, closely packed together, and often two deep. I have never through twenty years' observation seen this species in such great abundance.—*A. S. Packard.*

THE LEECHES OF JAPAN.—A recent account of the leeches of Japan, by Dr. C. O. Whitman, in the *Quarterly Journal of Microscopical Science*, is illustrated by colored drawings by Mr. Nomura, a young Japanese artist. That the Japanese can make excellent zoölogical artists is shown by Dr. Whitman's remark: "Mr. Nomura's attention to the minutest details, his infinite patience, trained eye, and his remarkably skillful brush, have given results that are marvels for neatness and accuracy." The Japanese land leech is, among others, the most interesting from its habits. It is confined to the mountain slopes and ravines, never descending into the plains. It is not only a mountain leech, but it keeps habitually to the ground, living in moss or under damp leaves and rubbish. They are most voracious, and on the approach of man or beast are at once on the alert. They advance by rapid strides. They bite so gently as scarcely to attract attention; but the wound is deep, and the scar is more or less permanent. They gorge themselves for about thirty or forty minutes and then drop; while sucking they become bedewed with a transparent liquid, which keeps them moist. If placed in water, they do not swim, but sink, and then creep out, and while having a decided preference for a terrestrial life, can support life for days in water. If into a jar of hungry leeches a puff of breath is blown, they become much excited, and it will be difficult to keep them in; while trying to keep back one, a dozen others will get out. The geographical area of land leeches is mainly within the tropics, though in Japan they are exposed to a wide range of temperature. A new medicinal leech was discovered, well known to the Japanese, and with habits just like the European leech. In these leeches the segmental organs are shown to be sense-organs, and the author believes that from them the eyes have developed, so that he regards them as incipient eye-spots.

SOME NOTES ON BIRD MIGRATIONS.—The City of Chicago is perhaps not the most favorable locality for observing the phenomena attending the annual flight of the birds, but with its abundance of fine parks and pleasant suburbs, it still presents some facilities for the ornithologist to pursue his favorite study. On March 24th, 1886, I visited, for the first time, Oakwood cemetery, situated about seven or eight miles south of the center of the city. It is a somewhat extensive enclosure of slightly undulating ground, well set with trees, many of them evergreens, which have attained to considerable size, and also containing quite a number of natural growth of still larger dimensions. The evergreens, so rare in the prairie region, render it at once a favorite resort for various species of the feathered race. At the time of my first visit, there was still a thin covering of snow on the ground, and signs of spring were not abundant. The trees, however, were well stocked with birds; tree-sparrows and snow-birds being, as might have been expected, very numerous. The most conspicuous figures of the population, however, were the blue-jays, which were present in greater numbers than I ever saw before on the same area. " Here," thought I, " is the favorite home of the jays, where they can get the protection of the evergreens, which the native forest denies, and breed undisturbed;" for shooting and birds-nesting are forbidden on that sacred ground.

For two weeks after my first visit the number of jays appeared undiminished, but as soon as signs of returning warmth were more apparent, I noticed a decided diminution in their ranks, till by the first of May not more than two or three pairs were left; and indeed it may be questioned whether these were not new-comers from some more southern point, while the original stock had all gone further north. It seems evident from this, as has been suspected before, that the jays, as well as others of our so-called " resident " species, are, to some extent, migratory, only within narrower limits than the great mass of birds. It would appear that the thick evergreen trees and the immunity from disturbance acted as an attraction to induce the jays to seek this place to pass the winter, so that they were collected here in far greater numbers than would ordinarily be found on any other corresponding area. It may be that at the approach of the breeding season they simply scatter themselves over the adjacent country, but as the land in that vicinity is, for the most part, devoid of trees, it seems much more probable that they go north to the more heavily timbered regions.

On April 17th, while visiting this cemetery and some other suburban fields, my attention was attracted by the great number of golden-winged woodpeckers or flickers, everywhere to be seen. Nearly every tree was occupied by one or more, and they were continually flying back and forth and calling to each other. They were, moreover, remarkably tame, and could be approached to within a distance of ten or fifteen yards. As I passed through a long narrow strip of low woodland, or grove, a dozen of these beautiful birds continued to fly from tree to tree not more than a pistol shot in front of me, until I had driven them the whole length of the grove, a distance of a quarter of a mile, when they took flight to another piece of wood a little further on. On April 23d, I again visited the same localities and not a single flicker was to be seen; and in a somewhat thorough search of the surrounding country, embracing an area of two or three square miles, I did not find a solitary specimen of the bird, either at that time or for a month after. A more complete "wave of migration" could hardly be imagined.

On April 9th, the city and suburbs were visited by a great number of yellow-bellied woodpeckers (*Sphyropicus varius*). They were to be seen on the trees in the yards and on the telephone poles along the streets, and my little son brought me a pair that had evidently been killed by flying against the telephone wires. For three days this invasion continued, and then all disappeared, and not another specimen was seen during the spring.

On my visit to Oakwood cemetery on April 17th, chewinks of both sexes were abundant. Six days later none were observed, and since then only an occasional specimen. The same fact was also noticed in regard to the white-throated sparrow (*Zonotrichia albicollis*). On April 23d the first were seen, and they were in swarms; within a week they too passed away, and only now and then a stray individual or pair were found.

On April 29th the redheaded woodpeckers (*Melanerpes erythrocephalus*) were first observed, and appeared in considerable numbers. On May 1st, wishing to secure a few specimens of this species, I again repaired to the same locality with my gun, but though I tramped over miles of woodland, I only saw a single individual, and that one was so wild and shy that I failed to secure him. The "wave" had passed on.

That the migrations of birds take place in pulses or waves has long been noticed; but I have never observed or heard of cases so well marked as those cited above. It would seem that this cemetery presents such exceptional advantages as a resting place, affording protection both from the barbarity of man and the inclemency of the weather, that it is selected as a way-station for various species, where they remain for a few days and recruit their exhausted energies preparatory to their farther flight northward.

The building of the Board of Trade of Chicago has a ring of electric arc lights around its dome, some three hundred feet above the pavements. The ring is thirty feet in diameter, and contains twenty lights. They were lighted for the first time on the evening of January 1st, 1886. On the night of May 8th following, a terrific thunderstorm passed over the city between the hours of 11 P. M. and midnight. During the storm the attention of the few people who were on the street at that time was attracted to the spectacle of a great number of birds hovering about this ring of lights and dashing at them. In the morning it was discovered that hundreds of dead birds were scattered about the foot of the tower, and hundreds more were found upon the roof of the building. When the workmen ascended the tower to renew the carbons in the lights, they found many of the globes occupied by the bodies of birds, some containing as many as eight, and many of the carbons had been broken off by the birds. Over two hundred bodies were picked up by one of the workmen attached to the building, which was but a small part of those carried away by the news-boys and others in the morning. A person who saw them before any were taken away, estimated that more than a thousand were killed. But even this was but a small portion of what were seen in the air about the tower. It is to be regretted that no person competent to determine the species of the birds killed on this occasion, was present when they were first observed. I understand that a few of them afterward fell into such hands, but I have heard no report. From the testimony of those who saw them they appear to have been, for the most part, the smaller song-birds.

The question arises, why was this great number of birds attracted on this particular night, when, during a month previous, while the migration was going on, no birds had been seen near the lights. It may be that they had been driven from their course by the storm, and so brought in contact with the dazzling beacon; or, perhaps, as birds are known to fly at great heights when migrating, the storm caused them to fly lower, and so brought them within the fatal influence. But several other storms of nearly equal violence had taken place in the night time within the two months of April and May, and with no similar attendant phenomena. The most reasonable conclusion, then, seems to be that the storm on the night of May 8th was coincident with a "wave" of bird-migration; that the birds flew low to get beneath the low-hanging clouds and avoid the violent winds of the upper atmosphere, and so were brought into the vicinity of the lights, and, in the intense darkness of the storm, were bewildered with the glare, and either rushed to an untimely fate, or fluttered helplessly about until the storm passed away, leaving the sky clear so they could see to pursue their journey.—*F. E. L. Beal.*

BAMBEKE ON HEREDITY.—The same *Bulletin* contains an interesting paper by M. Ch. Van Bambeke, on heredity, in which the theories of Darwin, Haeckel, Nägeli, Pflüger and others are subjected to a searching criticism. Both pangenesis and plastidulperigenesis are rejected as inadequate to explain all the phenomena of heredity, which, it is argued, can be accounted for only by supposing that the germ, Weismann's *Keimplasma*, is in fact continuous. It is not to be regarded as the final outcome of the ontogenesis of each individual, but passes from parent to offspring directly, being from the first present in an unmodified form in a large number, possibly in all the comatic cells. The germinative plasma persists through certain cellular series, concentrating itself anew in the embryonic cells of the new organism. In a word, in the phylogenetic development of the organisms the germ, whose true seat has now been determined, is perpetuated throughout the whole series of successive ontogenies. The generations succeed and efface each other, the Keimplasma alone is immortal. —*Nature, April 1, 1886.*

DOMESTICATION OF WILD FOWL.—The domestication of our beautiful wild fowl has for years been one of my hobbies; and some years ago, while living in Western New York, I hatched a brood of wood-ducks, which gradually disappeared one by one while I was away attending to other business, and the loss was attributed to rats or weasels. Circumstances prevented my indulging in this taste until three years ago, when I took it up again. I bought a flock of wood-ducks in 1883 and a mink killed them in March following. The next year I bought eighteen pairs of wood-ducks, but did not get an egg; attributed to keeping them confined in close quarters at night, and to feeding them on corn. This year the birds, which have been on the ice every day during the winter, were not confined at night after February, and were fed on buckwheat, wheat, watercress and clams, seem to be in excellent order, and paired off early. Nests were put up for them in boxes and nail kegs, three or four feet above the ground, and a great amount of inspection and house-hunting was done by them, and hopes were entertained that they would lay. One duck laid three eggs and stopped, these were set under a hen, but not one was fertile.

A pair of pintails presented to me by a gentleman in Montana, who caught them in the spring of 1884, have not yet laid. The male has shown a desire to increase his species, but his mate has paid no attention to his advances.

A pair of Chinese mandarin ducks imported by me two years ago, when they were a year old, have bred. From seven eggs put under a hen on the last day of June I had four ducklings on July 29th and three infertile eggs. These young birds at the present writing are strong and lively.

I have so far been unable to get green-winged teal, although I have offered prices which should tempt men who send these birds to market.

The eggs of the above wood-duck and the mandarin are from two inches to two and one-eighth in length, and one and a-half inches in depth. They vary some, and at first I thought I could distinguish the egg of the wood-duck from the mandarin's by its being more pointed, but the variation has been such that I do not feel at all confident of this.

Next season I shall enlarge my range, and make every effort to obtain other species, and to breed them.—*Fred Mather.*

ZOOLOGICAL NEWS.—*Mammals.*—Mr. Carter, of the London Colonial Exhibition, states that mice are among the enemies of frogs. He was a witness to an attack made by mice upon some frogs which infested a barn. They pursued and bit the batrachians, which had sufficient strength and alacrity to escape, but were again pursued and caught, until they were helpless from the severity of the bites, when the mice ate a portion of them.——M. F. Lataste describes (Ann. d. Mus. Civ. d. St. Nat. Gen., 1882–83) a new species of Jerboa (*Dipus darricarrerei*) from Algeria. Two other species, *D. ægyptus* and *D. hirtipes*, occur in the same region.

Birds.—Sr. T. Salvadori enumerates fourteen species of Megapodes in Papua and the Moluccas. These constitute a majority of the Gallinæ, the remaining forms consisting only of four Perdicidæ and *Turnix melanonota.* The Grallatores of the same region number seventy, viz: Rallidæ, 17; Glareolidæ, 2; Hæmatopodidæ, 2; Œdicnemidæ, 1; Charadriadæ, 8; Parridæ, 1; Scolopacidæ, 19; Ardeidæ, 17; Ciconiidæ, 1; Ibidæ, 2. Though most of these waders are widely spread, thirteen are peculiar to the region, or to parts only of the region. The Natatores of the same islands are forty-one, viz: Anatidæ, 6; Pelecanidæ, 11; Laridæ, 15; Procellaridæ, 7; Podicipidæ, 2. Two only, *Dendrocycna guttata* and *Podiceps tricolor*, seem to be peculiar to the region.——Sr. T. Salvadori (Ann. d. Mus. Civ. d. St. Nat. Gen., 1884) occupies 276 pages with an account of the birds of Shoa collected by Antinori. They include 307 species: Rapaces, 42; Psittaces, 3; Picariæ, 52; Passeres, 130; Colombæ, 9; Gallinaces, 5; Grallatores, 44; Natatores, 22. The proximity of Shoa to Abyssinia, the bird fauna of which has been so well explored by Ruppell, Heuglin and others, did not give hope of many novelties, yet at least five are new: Caprimulgus, 1; Psalidoprocne, 1; Euplectes, 1; Textor, 1; Podiceps, 1, and possibly two or three more. A few of the species belong to the fauna of the south of Africa, and have now first been met with north of the equator, while two species (*Platystira albifrons, Cryptospiza reichenowi*) have previously been considered peculiar to the west of Africa.

Reptiles.—*Proteus anguineus* is not, it appears from the statements of Dr. Marchesetti, confined to Carniola, but occurs also in Friuli, and has been found in the Istrian peninsula, in a stream of water running through the gallery of a lignite mine excavated in cretaceous strata.——*Nature* states that a very large Ascension turtle which recently died at the Colonial and Indian Exhibition, London, had existed without food for more than two months, and contained 100 eggs, the retention of which was the probable cause of death.——Mr. W. A. Carter, of the fisheries section of the same Exhibition, placed some small tortoises, 1¼″ long, of what kind is not stated, along with some frogs of about the same dimensions. The tortoises at once attacked the frogs, and bit pieces from the legs, repeating the operation afterwards.

Fishes.—D. Vinciguerra (Ann. d. Mus. Civ. d. St. Nat. Gen., 1882–83) describes the fresh-water fishes brought by the Italian Expedition to Equatorial Africa (Shoa), two of which, one of Haplochilus and one of Discognathus, are new.——The annals of the Genoa Civic Museum of Natural History (1882–83) contain an account of the ichthyological results of the cruises of the *Violante* in 1877 and 1880. The total number of species taken was 119, of which probably three, and certainly two, are new. These are *Gobius vittatus* Vinciguerra, taken on the north-east of Sardinia; *Blennius nigriceps*, taken near the island of Brazza, and a doubtful Exocætus.——Sr. Vinciguerra describes in the same volume the ichthyological results of the cruise of the *Corsair* around Madeira, Arnecife, Teneriffe and the Canaries. Only six of the thirty-five species do not occur in the Mediterranean.

Crustacea.—Mr. S. I. Smith (*Ann. and Mag. Nat. Hist.*, March) gives an account of the Decapoda dredged by the *Albatross* in 1883–85 from depths above 1000 fathoms. Of the forty-four species twenty-one inhabit the bottom or its immediate neighborhood, while most of the others, though from abyssal depths, are probably not confined to the bottom. Of six species (Acanthephyra, 3 sp.; Sergestes, 2 sp., *Pasiphaë princeps*) it is concluded that, though contained in the trawl coming from great depths, they are not truly abyssal.——*Parapagurus pilosimanus* has been dredged at various depths from 250 to 2221 fathoms. In the shallower depths it inhabits the carcinœcia of *Epizoanthus paguriphilus*, but in more abyssal localities some tenant the house made by *E. abyssorum*, others naked gastropod shells, and still others an actinian polyp, apparently *Urticina consors* Ver.——The abyssal Decapoda are among the largest of their respective groups. *Geryon quinquidens* is one of the largest brachyurans; *Lithodes agassizii* measures three feet across the outstretched legs, and six across the carapace; *Munidopsis bairdii*, *crassa* and *rostrata* are the largest known Galatheidæ; *Sabinea princeps* is probably the largest Crangonid, and two Penæidæ are about a foot in length.

Echinoderms.—M. Perrier has again attacked the so-called heart of echinoderms. His study of *Asterias hyadesi*, a new star-fish from Cape Horn, has led him to conclusions identical with those arrived at from the study of Comatula. The "heart" in Comatula is but a glandular organ, the point of departure of the reproductive organs, and there are no true vessels, only irrigation canals in which sea-water always runs. Part of the water which enters by the madreporic plate of Asterias passes into the sub-ambulacral cavities, the schizocele, and the genital cavity. Sea-water plays the part of blood not only in echinoderms, but in all zoöphytes, which M. Perrier believes ought to form a sub-kingdom, as arranged by De Blainville.

Vermes, etc.—W. Bateson (*Quart. Jour. Mic. Sci.*, 1886,) gives a continued account of the later stages in the development of *Balanoglossus kowalevskii*, and of the morphology of the Enteropneusta. This is followed by an article upon the ancestry of the Chordata in which he endeavors to clear away the difficulty interposed by the unsegmented condition of the Enteropneusta to their right to a place among the vertebrate ancestry. He holds that repetition of organs and sets of organs is of common occurrence among animals, but that, however far back a segmented ancestor of a segmented descendant may possibly be found, yet ultimately the form has to be sought for in which these repetitions had their origin.——The Bolletino of the Adriatic Natural History Society contains a list of the fauna of the Adriatic by Michele Stossich. The Cœlenterates are included in Vol. IX, No. 1, 1885.——M. Stossich (Boll. d. Soc. Adri. d. Sci. Nat. 1885) gives an account of various species of Distomum and allied genera found in the intestines of fishes in the neighborhood of Trieste.

EMBRYOLOGY.[1]

THE DEVELOPMENT OF THE MUD-MINNOW.—The ova of *Umbra limi* measure 1.6^{mm} in diameter and are laid singly upon aquatic plants to which they adhere for a time by means of a thin coating of adhesive matter which invests them. The vitellus and blastodisk is moderately clear and yellowish in color. Just underneath the blastodisk there is a rounded, flattened cluster of highly refringent oil-drops of small size. As the blastodisk spreads these oil-drops become more and more diffused or scattered over the vitellus just beneath the blastoderm.

At the time of the formation of the blastodisk, the vitellus displays a most active amœboid activity of its substance. This is so active that the outline of the vitellus changes very distinctly at intervals of a few seconds. In fact, I know of no teleostean egg which has been hitherto described in which such amœboid movements of the vitellus are so pronounced and rapid.

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[1] Edited by JOHN A. RYDER, Smithsonian Institution, Washington, D. C.